The Inequity Of Mathematics Education In The United States

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Abstract
The mathematics achievement levels of U.S. students fall far behind those of other developed nations. Within the United States itself, the students who are falling behind come predominantly from high-poverty and high-minority areas. The term "achievement gap" is used to describe the disparity in the academic performance between groups of students with African American and Hispanic students at the lower end of the performance scale and white students at the other end. Similar gaps in performance are also found between students from low-income and financially secure families. The effect of the achievement gap is far reaching. It can be found in grades, standardized-test scores, course selection, dropout rates, and college-completion rates. Research has shown that inequities exist in mathematics of education in the United States. In order to achieve equity in mathematics education for all students, a joint effort and combined resources from all interested parties-schools and teachers, school administrators, students and parents, community organizations, various government agencies, and mathematics organizations - is necessary. (Gutstein et al, 2005). The federal No Child Left Behind Act (NCLB, 2001) was passed in an attempt to close the achievement gap.

Introduction
First I wish to establish what the term equity means in the context of this paper, When I use the term equity I am referring to the definition of equity used by Lipman (2004).

> equitable distribution of material and human resources, intellectually challenging curriculum, educational experiences that build on students' cultures, languages, home experiences, and identities; and pedagogies that prepare students to engage in critical thought and democratic society (p.3).

In order to achieve equity in mathematics education for all students, a joint effort and combined resources from all interested parties-schools and teachers, school administrators, students and parents, community organizations, various government agencies, and mathematics organizations-is necessary. (Gutstein et al, 2005). The National Council of Teachers of Mathematics (NCTM, 2000) in their Equity Principle stated that all students must have chance to learn mathematics free from bias based on race, gender, socioeconomic status, and language. In addition, it emphasized that all students must have a chance to learn from a well-qualified teacher.

In a recent paper written by Gamoran and Borman (2006) on the 40th anniversary of 1966 Coleman Report, the researchers found that U.S. schools were highly segregated and noted inequalities in American public schooling, not only between schools but also within schools. After reviewing the last four decades, Gamoran found that:

> According to some indicators, the levels of segregation are nearly as high today as they were back in 1966.
>
> In addition, although the Black-White achievement gaps are smaller today than they were in 1966, they still remain substantial.

Orfield (1996) substantiated these results with his findings that 63% of all white students go to schools that are 90% to 100% white. Orfield concluded that schools are more segregated today than they were twenty years ago.

In addition, Borman, in re-examining the data from the 1966 Coleman Report, concluded the following:

> "Even after taking into account students' family background, a large proportion of the variation in student achievement can be explained by school characteristics. Fully 40% of the differences in student achievement can be found between schools.
> Inequalities in student achievement within schools are explained in part by teachers' biases favoring middle-class students and by schools' greater reliance on academic and nonacademic tracking."

These are just a few of the factors that are believed to contribute to the achievement gap.

Factors That Contribute to the Inequity in Mathematics Education

There are several other factors that affect student learning and the achievement gap between students from different racial and socioeconomic groups. Julian Weissglass (2002) believed that "The student/teacher/mathematics triangle is located in a classroom, in a school, in a district, in a community that is situated in a larger society. People in this community and in the larger society hold beliefs, attitudes, values, and often deep emotions about a variety of issues—teaching, learning, assessment, the nature of mathematics, the nature of schools in a democratic society, race, class, gender, sexual orientation, culture, and language—to name a few" (p. 34). These factors include but are not limited to the classroom, school, school district, community, and society. The beliefs, attitudes, and values held by society and the community affect inequality in mathematics education. The National Assessment of Educational Progress (NAEP) 1999 Long Term Trends Summary data have been used to show that several factors, such as socioeconomic status, school policies, allocation of human and material resources, and classroom instructional practices, may account for performances disparities in mathematics (Oakes 1990; Secada 1992; Tate 1997).

In the U.S. society, white middle class children may be misinformed, indifferent, or ignorant about the history and the lives of people different than themselves. Such differences may include background, lifestyles, culture, race, and socioeconomic status. Since most curriculum developers are white middle class people, the concerns of racial and ethnic minorities are often ignored in curriculum, or when these curriculum developers try to address these concerns they do not relate mathematics to the concerns of students who are living in poverty because they tend to choose problems that are noncontroversial and neglect issues related to social justice. Weissglass (2002) believes that any attempt to decrease the achievement gap and the inequities in mathematics education in the United States must first address the racism/classism that exists in our country.

Another aspect to consider is the mismatch between the learning styles of African American students and the pedagogical styles of educators and the behavioral environment of schools. According to Lubienski (2001) this mismatch is one of the contributing factors to the low achievement of African American students in mathematics and science. Other researchers (Allen and Boykin,1991) believed that these mismatches have resulted in educators underestimating the ability of African American students and concluding that these students are less able to learn higher levels of mathematics.. This is can be seen when language and behavior issues are addressed: African-American males are often attributed with physical activity or disruptive behavior in the classroom that leads to high grade-level retentions, placement in special education classes, and increased negative discipline. (Cazden, John, & Hymes , 1972)

Viadero (2000) and Kober (2001) have cited some other factors that contribute to the gap-poverty, academic coursework, peer pressure, high mobility of students, teacher quality, parenting, less access to preschool programs, stereotypical threats, disciplinary atmosphere, the summer effect (lose ground over the summer), and teacher expectations have been linked to the achievement gap. According to the Association for Supervision and Curriculum Development (ASCD) Advisory Panel on Improving Student Achievement some additional barriers are tracking, lack of bilingual instruction and the negative impact of testing (Cole, 1995 and Oakes and Lipton, 1992). A disproportionate number of minority and lower-income students are assigned to lower tracked classes, thus being denied access to quality teachers and materials, as well as access to higher level mathematics classes. (Oakes, Ormseth, Bell, & Camp, 1990; Gamoran, 1992) Educators at the Harvard Graduate School of Education (1992) stated, "One of the most disturbing aspects of the tracking issue is its potential to divide communities along racial and social class lines."

Another important factor to examine is the unequal funding of schools. England (2005) believed that unequal funding lies at the root of the problems of our public schools and contributes to the inequity in mathematics education. Schools in the United States are both separate and blatantly unequal. When examining the inequities in mathematics education in the United States, it is imperative to consider how schools are funded. Almost half of a school's funding comes from local property taxes. This means that white suburban schools have a great deal more money than inner-city schools, which serves students who are 90-100 percent students of color. To put this in perspective, in 1992 in Texas, per-student spending ranged from $3,098 to more than 10 times as much $42,000. (England, 2005) Unequal funding results in lack of resources, inadequate training, lack of staff, high teacher turnover, overcrowding classrooms, and deteriorating school buildings for low-income school districts.

Promising Instructional Practices

All is not lost, however. Research has shown that there are instructional strategies that have shown promise when teaching African American students. Slavin (1977), Treisman (1992), and Boykin (1994) found that African-American students work well in cooperative groups, and appear to achieve at high levels when allowed to learn in cooperative groups. Ladson-Billings (1994) found that the use of "culturally responsive teaching" to be an effective pedagogical strategy when teaching African American students, as well as other minorities. Gay defines "culturally responsive teaching" as incorporating cultural knowledge, students' prior experiences, and the learning styles of the students into your teaching in an effort to make learning more appropriate and effective for students. Ladson-Billings' (1992) work on culturally responsive pedagogy mirrors the finding of Gay. Work by Sizemore (1988) has shown that there are organizational features, academic routines, qualities of leadership, and staff support that, if followed, will end in high achievement for African-American students consistently.

Recommendations and Essential Components of a Policy to Make Mathematics Education More Equitable in the United States

There is a general consensus among researchers in the area of equity and access of mathematics education that programs need to be devised that implement effective pedagogical strategies, equal allocation of resources and support, organized community outreach effort, professional development that empowers teachers, and reformed district policies and practices to help make the mathematics education of all students more equitable. Some of the essential components of such an effort are listed below.

Increase the percentage of people of color in curriculum development groups.

Set clear, high goals for all students.

Ensure equitable distribution of resources..

Increase the number of minority/underrepresented students taking higher-level mathematics courses.

Curriculum aligned to those goals.

Provide extra instruction for students who need it.

Good teaching matters more than anything else. Ensure that minority students get experienced, qualified, effective teachers.

Provide effective professional development that includes culturally responsive pedagogy.

Use effective collaborative learning.

Devise and implement good assessment methods.

Researchers Kain and Hanushek (1999) have found from Texas schools that having an above average teacher for five years in a row can completely close the achievement gap.

Empower Parents: Parents will have more information about the quality of their child's school.

Closing the achievement gap needs to be placed on the national agenda. Moses (2001) stated that mathematics education was a new civil rights issue. He argues that children who are not mathematically literate, may be doomed to second-class economic status in our increasingly technological society-specifically, algebra acts as a curricular gatekeeper without which students are unable to achieve economic freedom.

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